ART. VI.—*The Ophthalmoscope as a Help to Diagnosis of Brain Disease.* By HENRY D. NOYES, M. D., Surgeon to New York Eye and Ear Infirmary, Professor of Ophthalmology in Bellevue Hospital Medical College.

THE connection between cerebral disease and injury to sight has long been recognized. The precise mode of connection has not been fully understood, because in pre-ophthalmoscopic times the lesions could be observed only when autopsies were made. Even then not always were the optic nerves and retinæ examined, because their morbid processes were esteemed of subordinate importance, and it was assumed that the loss of sight was produced by simple paralysis of the optic nerves, in a manner similar to paralysis of nerves going to voluntary muscles.

It has ever been an important point in cases of brain disease to inquire into the condition of the eyes and of sight, and valuable information has been thus afforded. It has been customary to look for strabismus, for changes in the pupil, and for impairment of vision. But the nerves supplying the ocular muscles may entirely escape injury; the pupil, too, is often wholly unaffected, and, when paralyzed, becomes so chiefly through the medium of the sympathetic nerves.

The function of sight has seldom been properly investigated. In the first place, suitable test types, such as those of Snellen, Jæger, &c., are far from being in general use. Even when care is used, with or without these tests, the condition of eccentric vision is almost never examined. The importance of doing so will be seen when it is remembered that, in going to the peripheral parts of the retina, the optic nerve fibres have to travel a greater distance than to its central portions, and, being more remote from the cerebrum, are likely to be first to suffer. The exploration of the visual field is very easily done by making the patient close one eye and with the other look the observer in the face, who holds up his hand at the side, above, and below, and ascertains whether the patient is able to count fingers or notice the movement of the hand, when he can see it only by indirect vision. Important information is often to be thus elicited.

Since the employment of the ophthalmoscope pathological changes within the eye have been accurately classified. We can easily recognize and observe retinitis, acute and chronic, also neuritis optica. Atrophy of the optic nerve and retina are frequent causes of blindness. Many cases of loss of sight have been noted resulting from diseases of the intra-ocular bloodvessels, such as apoplexies of the retina, embolism of the arteria centralis retinæ, hemorrhage into the sheath of the optic nerve, and by hyperæmia as well as ischæmia of the retina.

It is important to state that inflammation and atrophy of the optic nerves and retinæ often take place as exclusively local affections, and do not imply trouble in other parts of the nervous system.

When, however, disease of the brain or of the spinal cord does cause loss of sight, there must be physical lesions capable of being appreciated, and since intra-ocular phenomena can be so thoroughly scrutinized by the ophthalmoscope, we have no excuse for neglecting to observe them. They cannot be void of interest, and they may give us important help.

But we cannot put off inspection of the interior of the eye until loss of sight shall have declared itself. The early period of hyperæmia is of far more importance to the welfare of the patient than a later stage, when other signs may have elucidated the diagnosis, but belong to a morbid condition much less controllable by treatment. At this hyperæmic stage, we would not anticipate much or any loss of sight; therefore it behooves us to look for ourselves. Another most remarkable fact compels us to use the ophthalmoscope when no complaint has been made of dimness of sight —there may exist an advanced and strongly pronounced degree of neuro-retinitis, the result of brain disease, and cause only insignificant injury to sight. This statement appears paradoxical, but I have had opportunity of verifying it in the most positive manner.

A case in which Dr. Benedict, of Vienna, had diagnosticated disease of the cerebellum, was, in accordance with his invariable custom, submitted to examination by the ophthalmoscope. The patient's vision, by Snellen's types, was equal to 1; visual fields of normal extent; pupils active; no strabismus. The optic nerves were found congested, infiltrated, markedly elevated by swelling, and dotted by minute ecchymoses; the border of the disks ill defined; the retina also infiltrated, swollen, and containing patches of plastic exudation; the retinal vessels turgid.

I had the opportunity of observing this case, by the kindness of Dr. Benedict, and inspected the fundus oculi with great care, both by the direct and indirect method of ophthalmoscopic examination. The diagnosis was fully sustained by all who saw the case in Prof. Arlt's Ophthalmic Clinique, and there could be no doubt, from a number of symptoms, that the patient had a chronic brain disease; he had severe headache, memory impaired, gait unsteady, &c.

I find this surprising discrepancy between the physical and functional condition of the nerve and retina under these circumstances alluded to in an abstract of seven cases of neuro-retinitis from brain disease, published in the St. Petersburg *Med. Zeitschrift*, Bd. x., 1866, by Dr. Blessig, and quoted in *Klinische Monatsblätter für Augenheilkunde*, Aug. 1866, p. 273. One patient remained a half year under observation without any change in the state of the fundus oculi or in the degree of vision, there being neuro-retinitis as described above with vision =1.

Based upon these facts the argument for making ophthalmoscopic examination in all cases of brain disease becomes irresistible. Indeed, a moment's reflection would lead to this conclusion, without any considerations drawn from pathology. The optic nerve is only an outlying portion of the brain; its extremity is fully exposed to view. Situated within about two inches of the brain, it is the only nerve in the body which we can inspect; it contains bloodvessels which communicate directly with the intracranial circulation. We thus come into relation with the cerebrum by continuity of nerve structure and also of bloodvessels. The course of the optic tracts at the base of the brain in contact with the base of the skull, renders them very liable to interference from the growth of tumours, and from local meningitis or periostitis, diseases which take place in this part of the cranium more frequently than in any other. So, too, intra-cerebral processes and diseases of the spinal cord influence the optic tracts by their relations with the corpora quadrigemina. I must also not omit to allude to the situation of the internal carotid artery, and of the great cavernous sinus in the closest vicinity to the foramen opticum. It is almost impossible for these great conduits to be surcharged, without causing congestion of the arteria and vena centralis retinæ, the former coming by the ophthalmic from the carotid artery, the latter emptying into the cavernous sinus.

While strenuously urging the importance in all cases of brain disease of making examination of the interior of the eye, I must in fairness state that in many morbid conditions of the brain there will be no lesion of the optic nerves; but at this no one will be surprised. On the other hand, the inspection of the optic nerves must be fairly made. The usual method of examination by the indirect method with a two inch objective is wholly inadequate to detect incipient morbid changes—even with an objective of three inches focus, aided by a ten inch lens behind the mirror, the amplifying power is not sufficient. It is far better to use the direct method, bringing the mirror close to the eye, and, if need be, correcting the observer's or patient's error of refraction by a proper lens, and it is also better to secure a moderate dilation of the pupil. It is hardly worth while to assert that ophthalmoscopic examination with proper care can do no harm to the patient—the notion of its pernicious influence on sight, except where there is a high degree of intolerance of light, has long ago been exploded. If a patient be unable to sit up, by bolstering with pillows, it is easy to put him in a posture convenient for examination. The room need not be utterly darkened, and a kerosene lamp will suffice.

A convenient instrument for hospital use, where a large ward can be only very imperfectly darkened, has been contrived by Galezowski. The objective and mirror are contained in a draw-tube, to be held in the hand, and the end supported on the patient's brow. The image being formed within the tube is not interfered with by surrounding light. It is, however, possible to employ with this instrument only the inverted image.

In estimating the diagnostic value of intra-ocular appearances, I would not make too much of my subject. When lesions are found in the eye, there may coexist other symptoms which have rendered the diagnosis perfectly clear, and the ophthalmoscope may be unnecessary, but it gives confirmation and strength to the medical opinion, and in the scientific view it ought not to be undervalued.

But every practitioner knows that brain diseases are often exceedingly obscure; and these cases are of various kinds, such as the growth of tumours, subacute and chronic meningitis, commencing hydrocephalus, chronic and acute softening, etc. It is under these circumstances that the physician will be glad to get any help in diagnosis, and he may obtain it by the ophthalmoscope. He may get a positive assurance that there is intra-cranial disorder without being able to state its exact nature, but this assurance will be of the highest value in deciding his treatment, and in relieving his own mind of harassing perplexity.

We are not yet able to infer the nature of the intra-cranial disorder in view of the phenomena of the optic nerve and retina, with certainty; in some instances we can get a high degree of probability. But the subject is yet far from being fully developed; we have to make many more ophthalmoscopic observations and autopsies before we shall reach this degree of accuracy of diagnosis. In Bright's disease we can now infer with tolerable certainty the state of the kidney from the chemical and microscopic examination of the urine; but this inquiry was begun thirty-five years ago. It is scarcely five years since the line of investigation now under discussion was fairly begun. Already two treatises have appeared in France, viz: "*Etude Ophthalmoscopique sur les Altérations du Nerf Optique et sur les Maladies cérébrales dont elles dependent*, par X. GALEZOWSKI. Paris, 1866. pp. 179," and "*Du diagnostic des Maladies du Système par l'Ophthalmoscope*, par E. BOUCHUT. Paris, 1866. pp. 503." In various ophthalmic journals cases are recorded, and there is great activity in pursuing these studies.

Among the diseases in which he has made ophthalmoscopic inspection and found lesions more or less frequently, Bouchut enumerates meningitis, acute and chronic, tumours, abscess, hydrocephalus, phlebitis of the sinuses, epilepsy, insanity, delirium tremens, febrile delirium, locomotor ataxy, softening, and apoplexy. Out of thirty cases of cerebral hemorrhage, in nineteen there were marked changes observable with the ophthalmoscope.

The lesions which may be seen are as follows:—

In the optic nerve capillary hyperæmia and loss of transparency of its structure. (It is not easy to decide what tint of redness in a given case shall be considered morbid, because the complexion of the optic nerve varies about as much as the complexion of people's faces. It is only the deepest tints which can be asserted to be evidences of disease, unless there has been previous opportunity for examination, or the other eye presents a different and healthy appearance.) The nerve becomes infiltrated, its outlines lose distinctness, and the bundles of fibres become visible in delicate lines radiating into the surrounding retina. The nerve becomes swollen and elevated to a prominent papilla. This has been most frequently noticed in cerebral tumours.

In the retina there will be similar appearances, turgidity, varicosity of vessels, serous transudation, exudation of yellowish plastic lymph—either in patches or in specks, and ecchymoses.

(It is sometimes difficult to discriminate the lesions of the retina which belong to Bright's disease from those now under consideration. The best evidence is perhaps the peculiar glistening lustre and refractive qualities of the minute specks of fatty degeneration found in Bright's disease. But on this point we must still speak cautiously.)

Besides the inflammatory states, the condition of atrophy occurs both as a primary lesion and as the usual sequence of neuro-retinitis. As a primary lesion it accompanies chronic disease both of the brain and spinal cord. When ensuing after inflammation of the nerve or retina it sometimes comes on very soon after the beginning of the disease. In the atrophy which succeeds neuritis the margin of the disk is for some time ragged, and, though discernible, shades with the surrounding tissue. Its colour is a light gray or dirty white. In primary atrophy the limit of the nerve is strongly marked, and its colour is an intense dead white. After the lapse of months the appearances in the first case change to those of the second, and it is impossible to assert what may have been the original disease.

Less frequently than the above we find embolus of the arteria centralis, or of the vein, and ischemia. Occasionally acute glaucoma comes on in consequence of cerebral trouble. Of this I shall speak again.

We are not yet in position to trace the intra-ocular lesions to their exact cause; that is, to say what kind of cerebral disease they indicate. A number of cases have been reported in which cerebral tumours produced neuro-retinitis with swelling and infiltration of the papilla. See *Archiv für Ophthalmologie*, bd. xii. abth. ii. 114. Also *Ibid.*, bd. vii. ab. ii. 74. *Ophthalmic Hospital Reports*, vol. v. part i. page 94, and part ii. page 163. *Ibid.*, vol. v. part iii. page 177. *Klinische Monatsblätter für Augenheilkunde*, vol. iv., June and July, page 164. *Ibid.*, vol. iii., March and April, page 121. *Ibid.*, vol. iv., August, page 275. See also *Sitzungsbericht der Ophthalmologischen Gesellschaft* for 1864, page 74. The last allusion describes a case of entozoa in the brain, causing neuro-retinitis and other symptoms.

This form of inflammation is called neuritis descendens, to indicate its connections. It is supposed to imply increase in the pressure of the intracranial mass. It has been found to result both from encephalitis and from tumours. It may be communicated along the course of the bloodvessels—that is, in consequence of vascular disturbance—or by a morbid process going down the sheath of the nerve and the inter-fibrillar connective tissue.

In many instances nothing can be found in the optic nerve save an undue amount of connective tissue and nuclei, while at the point where the nerve penetrates the sclera, œdema, redness, and swelling appear. This would appear to be caused by strangulation of the nerve in the porus opticus, this unyielding orifice acting, as Graefe remarks, as a "multiplicator" of the inflammatory process. The fact has been several times observed, and is a very interesting pathological phenomenon.

The case of continuous orbital neuritis optica and peri-neuritis is thought to be more frequently associated with simple meningitis, not depending on tumours. On the other hand, and showing the need of future careful observations, white atrophy sometimes follows from the growth of tumours without precedent neuritis.

A very interesting case of intra-cranial tumour continuous with a malignant growth in the orbit, is given in *Archiv für Ophthalmologie*, bd. xii. abth. ii. page 100. The orbital disease was in the left side—the intra-cranial tumour commenced on the same side, but crowded over to the right and completely swallowed up the right optic nerve and the chiasm. Prof. Virchow was unable to find any trace of either in the mass. Yet vision of that eye was perfect, and the fundus oculi normal. Death took place from meningitis.

Another case of general surgical interest is given in the same journal (Bd. xii. abth. i. page 1), where fracture of the supra-orbital plate occurred and gave rise to neuro-retinitis, and also meningitis. The symptoms came on three weeks after the injury, and while other symptoms pointed to inflammation of the brain, the fundus oculi gave a striking picture resembling the intra-cranial process.

A most interesting and elaborate paper on this subject is in *Ophthalmic Hospital Reports*, vol. iv. part iv. page 389, by Dr. Hughlings Jackson; it is the best which has yet appeared in English.

My purpose has been to draw to this subject the attention of the profession in this country, and to persuade them to take in hand the ophthalmoscope as an important aid in diagnosis. So important is it that no hospital should be without the instrument, and some one or more of its medical attendants ought to take the pains to learn to use it. Men who study the microscope can quickly master the optical principles of the ophthalmoscope, and a moderate experience will teach them the principal lesions to be observed.

I will conclude this paper by relating a few cases illustrating the foregoing remarks:—

CASE I. *Hyperæmia of retinæ and of the base of the brain.*—Oct. 6, 1866, Mr. T. B. S. J., æt. 17, N. Y., has for many years suffered severely from headache, which rarely entirely ceased, and frequently occurred in extreme severity. Many times sleep has been on this account impossible. Attendance upon school has been very irregular; mental effort would increase the headache. Five years ago had two attacks of wry-neck, one of which lasted six months; besides this spasmodic contraction of the sterno-mastoid, has had no other muscular disturbance. Has no marked paralysis; had no twitchings nor convulsions; bowels regular; no nausea. Intelligence and memory good. During four months, about two years ago, was free from headache, but afterwards it returned with renewed intensity. For five years has had great difficulty in reading, because the effort gave his eyes so much pain. His vision has been clear until within four months, and now a thin cloud obscures it, both for distant and near objects. Has occasionally had diplopia. Has evident insufficiency of internal recti muscles. Is uncomfortably sensitive to light.

Vision tested by Snellen's types, is as follows: Right, $\frac{20}{30}$; left, $\frac{20}{60}$; refraction, both emmetropic; visual field, right normal; left contracted below, and fixation very painful.

By ophthalmoscope, right, nerve disk well defined; edge of choroid decidedly pigmented; capillary hyperæmia very marked; slight physiological excavation; retinal veins full; arteries small; no infiltration of retina; no other lesions. Left eye presents same appearances.

In consideration of the long duration of symptoms—and that in spite of skilful and persevering treatment—fearing too that some organic change might be going on in the nervous centres, of which the eye trouble might be only a part—I determined to give my patient the benefit of a consultation with Dr. Brown-Séquard. I gave him a note to the doctor, who sent in reply the following:—

> "*Dear Dr.*:—Your patient has been suffering for a great many years (since he was only four years old) from congestion in the base of the brain and in the meninges, and has no organic affection of the nervous centres. All his symptoms, in fact, are due to the very same thing which you have noticed in his retinæ, *i. e.*, hyperæmia. This congestion of the base of the brain has gone far enough or lasted long enough to produce a slight paralysis of motion of the left limbs and a slight anæsthesia of these limbs and of the left side of the face.
>
> "I do think that he will have a good chance of being better, if not of being cured, by the following means of treatment. First, an application of ice on the spine (between the shoulders) every other day. Secondly, the use of the two ointments for which I inclose a prescription. Thirdly, the introduction of atropine put up in gelatine disks, between the eyelids every day. This mode of treatment I have found to be most useful in neuralgia of the eye connected with hyperæmia of the retina. Fourthly, I would propose his taking the mixture prescribed for a period of about two months. I give him other rules of which he will speak to you.
>
> I am, dear Dr., with great regard,
>
> Yours sincerely, C. E. BROWN-SÉQUARD."

It will be observed that to Dr. Brown-Séquard's nicer methods of appreciation the existence of slight paralysis of motion and sensation became known. The treatment actually pursued was the application of ice between the shoulders for fifteen minutes every second night, and done only four times, because it was painful, and the patient caught cold. The ointments were, ℞. Aconitinæ, gr. $\frac{1}{4}$; veratriæ, gr. $\frac{1}{6}$; adipis, ʒij; also, ℞. Aconitinæ, gr. j; adipis, ʒiss. The first of these to be used night and morning on the forehead, the second on occasion of more severe paroxysm of headache. The atropia was not employed. The mixture was as follows: ℞. Ammonii bromidi, ʒiss; ammonii iodidi, ʒij; ammonia sesquicarb. ℈j; infus. calumbæ, ℥ij. A teaspoonful twice a day, before meals, with a little water.

The second time after using the ice the headache began to abate.

Twelve days after beginning the treatment my notes state: Headache much diminished; able to read fifteen minutes. Vision, right $\frac{20}{30}$, left $\frac{20}{30}$. Improvement continued without interruption. He was not allowed to read; but felt able to do so. On Dec. 6th, when he was regarded as cured, the notes are: No pain in head or eyes, reads and writes without any trouble, for several hours. Is no longer sensitive to light. Vision, right $\frac{20}{20}$, left $\frac{20}{20}$. By ophthalmoscope, both optic nerves have the normal hue, retinal vessels their natural size.

The above case was to me highly instructive, not only in diagnosis, but especially in treatment. I am happy to acknowledge my indebtedness to Dr. Brown-Séquard. As to the value of the ophthalmoscope, it gave distinct visible evidence of the morbid process in the brain, which had embittered this young man's life, disqualifying him from entering upon any business. It is true, this disease declared itself by other signs, but the optic hyperæmia was certainly of no small value in strengthening the diagnosis. The success of the treatment was also in the highest degree gratifying.

CASE II. A man about 35 was suffering from a moderately severe attack of delirium tremens. His urine contained albumen; he had not slept for three nights; pulse 80, and irregular. I made examination with the ophthalmoscope, and found in both optic nerves a high degree of capillary hyperæmia and turgescence of the retinal arteries and veins. There was, however, no effusion into the retina, nor into the optic nerve. It is probable that this form of delirium is accompanied by fulness of the vessels of the brain, and that the state of the optic nerves indicated it.

CASE III. A lady about 50, having slight paralysis of the right arm, which had come on suddenly, unable to articulate distinctly, mind confused. The ophthalmoscope did not detect any lesions which could be connected with the supposed cerebral trouble.

CASE IV. A girl about 25, with paralysis of one side of the body, which had existed several months. Nothing morbid could be seen with the ophthalmoscope.

CASE V. A woman about 50, with complete paralysis of one side, including the tongue and face. The diagnosis of cerebral hemorrhage had been made, and was confirmed by the ophthalmoscope. The optic nerve was intensely congested, and so were the retinal vessels. It was difficult to distinguish the outline of the optic disk, from the surrounding red fundus.

I have introduced the last three cases, to illustrate how sometimes nothing can be seen in the eye to aid in diagnosis, and, again, strong confirmatory testimony can be obtained.

In cases of paralysis, the absence of ocular signs has a value in this respect. It signifies, either that the cerebral mischief is acute softening, or a *small* clot, or a clot situated remote from the optic tracts.

I will now relate a case, in which the ophthalmoscope was not simply accessory to the diagnosis, but gave the only positive diagnostic signs, and in which no other testimony was considered by able practitioners deserving of trust.

CASE VI. *Acute glaucoma, cerebral apoplexies, and softening.*—Mr. C., æt. 59, shoemaker, N. Y., of strictly temperate and correct habits, and, until within two years, in robust health, had been advised a year ago, by his family physician, Dr. McC., to confine himself less strictly to business, because of unpleasant head symptoms.

On Oct. 12, 1866, Dr. McC. was called to see him, suffering from severe pain in the head, not confined to any one spot, accompanied by constant restlessness and decided mental exaltation, which did not amount to delirium. He talked a great deal more than would be produced by his suffering. His respiration was peculiar, not hurried or difficult, but sighing. He would once in a while draw a deep, long breath, fully inflating his lungs, and not be able to explain why he did so. The pulse from 90 to 100, temperature natural. Of his own accord he took cathartic pills, and for twenty-four hours vomited incessantly.

For three days the headache and other symptoms continued, and then his eyes began to be inflamed. The left eye was first affected, and while symptoms began with intolerance of light, tenderness to touch, and conjunctival injection, they rapidly increased to great swelling of the lids, chemosis, and almost entire loss of vision. At the same time the headache was aggravated, and located in the forehead.

Both globes were hard to the touch, feeling like bullets under a cushion. Left eye, count fingers at twelve inches; no examination with ophthalmoscope. Right eye just beginning to be affected, tense, injected, vision good.

As there was no doubt of the nature of the case, viz., acute glaucoma, and that its proper treatment would not permit delay, I proceeded at once, 8 P. M., by the light of kerosene lamps, to do iridectomy. Putting him under the influence of chloroform, I excised in the left eye a piece of the upper part of the iris. In the right eye, I made an incision precisely similar, but refrained from cutting the iris. I was led to do this, because the inflammation was moderate, and I hoped paracentesis would suffice. The sequel will show the fallacy of this hope. Applied a flannel bandage and picked lint. The next day, eyes were much better, headache almost gone. During night, took sulph. morphiæ, gr. $\frac{3}{4}$; did not sleep, was free from pain; changed bandage; globes now decidedly soft, chemosis beginning to abate.

On the 22d, that is, the third day after iridectomy, counts fingers with left eye at six feet. The eyes steadily improved, and on the tenth day bandage was finally removed. On November 9th, a careful examination was made with the ophthalmoscope, the patient being able to come a distance of a mile and a half to my office. My notes say, in right eye there has been a little return of pain, *tension rather greater than normal.* T_1? media clear, a minute hemorrhage on nerve, the vessels bend a little at margin of disk, surface of nerve of pink hue. Left eye, *tension normal*, media clear, retinal veins little turgid, nerve pink, not cupped. Vision, right $\frac{20}{70}$, left, $\frac{20}{70}$. Right, with +8 reads Jæger 5 at 10 inches. Left, with +8 reads Jæger 9 at 10 inches. Has hypermætopsis about $\frac{1}{12}$.

Up to the time of this note, which was three weeks from beginning of sickness, the general symptoms had been variable. He was sometimes, apparently, nearly well, and again would go to bed. He had pain over different parts of the head as well as different parts of the body, now in one leg, now in the other, sometimes along the sciatic nerve, sometimes in the side, sometimes at the lower part of the back. Remaining fixed for a few hours or days in one location, it would then settle on another.

At all times, headache was the prominent pain. It was not fixed to one spot of the head. He had no paralysis and no anæsthesia. Pulse from 80 to 108. Radials hard, as if they might be atheromatous. Bowels torpid, but not difficult to move. Stomach intolerant of certain things, but no tendency to vomit, unless irritated. Urine in usual quantity, without albumen, and without casts. Would frequently draw a long sighing breath, and in a sort of involuntary way. Lungs and heart healthy. In sitting for examination, with the ophthalmoscope, would move in the chair uneasily, and say he could not help it. He had turns of marked mental exaltation, when he would talk a great deal, yet rationally. Spirits depressed, never had delirium; sleep always bad. His present behaviour is very different from his usual manner. A rather illiterate man, he yet had a well balanced mind, was deliberate in speech and action, and governed by sound principles.

In view of all his symptoms, which at first the attack of acute glaucoma seemed to sufficiently explain, it became evident that there must be something else the matter. But no definite opinion could be formed.

Nov. 18. *Glaucoma returning in right eye, acute inflammation has begun, globe hard and painful.*—(This is worthy of note, because a large paracentesis had been done at the time of the first operation, in the exact spot, for iridectomy. But the relief was not permanent. However difficult it may be to explain the way in which excision of a piece of iris can cause permanent diminution in the tension of the eyeball, the case now related offers undeniable proof that iridectomy, and not mere paracentesis, is necessary to relieve morbid tension, such as we have in glaucoma.)

Giving the patient chloroform, I did iridectomy upwards. The result was good, but vision was slow in returning. The vitreous humour remained hazy for about ten days. When it cleared up enough to see the optic nerve distinctly, I found upon it the same point of ecchymosis noted before, and the colour of the surface normal. No signs of glaucoma. In the mean time the general symptoms were of the same character as before, only that his strength was more diminished. Headache oftentimes most intense. General neuralgia rather less than formerly. Spent a good deal of time in bed, yet would sometimes be able to go down stairs. Sleep very light.

The remedy which seemed to give most relief was the bromide of potassium, at night, in scruple doses. He called these his sleeping powders. Nervines and tonics were administered; opium was not tolerated. In a few instances, ice applied between the shoulders gave relief to the headache, but it ceased to be efficacious.

Dec. 5. About this time I noticed a change take place in the appearance within the right eye. The optic nerve began to alter in colour; its usual pink passed into a decided pallor; the retinal vessels remained unchanged. As this hue became decidedly pronounced, and indicated atrophy of the nerve, the conviction was forced upon me that there must be serious disease of the brain, and this the cause of all the trouble.

I announced my opinion to the family, and gave an unfavourable prognosis. The gentleman who had the charge of the case, one of our most sagacious practitioners, was not able to share in the positiveness of my opinion, although he would not deny that there might be brain disease. The absence of paralysis and anæsthesia, the clearness of the intellect, and the want of fixedness in the location of pain, were, in his view, serious obstacles to the diagnosis. He thought the symptoms might be explained by hysteria, the cause being obscure.

Another medical man was called in consultation, one of our best pathologists and teachers. He emphatically declared that there was no evidence of brain disease. He suggested that malaria might have caused the troubles, and as the stomach had become irritable, advised injections of a solution of sulphate of quinia per rectum. This remedy proved as useless as all others. Soon the anxiety of the family induced them to try another mode of practice, and homœopathic gentlemen were called. On the certificate, they stated the cause of death to be general debility.

Patient died Jan. 7th, three months from the beginning of his sickness.

For a few days preceding death, his condition was as follows: Rapid and extreme prostration; uncontrollable vomiting for thirty-six hours, after this, coma continuing forty-eight hours, then death. Symptoms conclusively declaring the existence of cerebral disease. There were no symptoms of either heart or lung trouble, no cough, no difficulty of breathing, no expectoration. These facts were ascertained by careful inquiry from the family.

Autopsy seventy-two hours after death.—Weather cold; body on ice and nearly frozen. Only the head could be examined. The scalp thick and very difficult to turn back, because almost congealed by the cold. Nothing peculiar about calvarium. Membranes a little congested; no effusion. At the base of the brain, on arriving at the optic nerves, very great care was used, and at the sella turcica, a black and softening mass was seen, at first supposed to be a tumour. After the brain was taken out, the following was observed: In the tuber cinereum and infundibuliform process and pituitary body, an effusion of blood which was of a dark colour, evidently of somewhat advanced age. Inasmuch as these parts are directly behind, or in contact with the optic commissure, the latter must have been influenced by the clot.

Another clot, about the size of a hazelnut, was found in the right lobe of the cerebellum, at its posterior edge. This too, was evidently of some weeks' or perhaps months' duration. The substance of the brain was firm to the feel; on slicing down the hemispheres, nothing abnormal was seen. The corpus callosum firm and healthy looking. When the lateral ventricles were opened, the septum lucidum, and fornix, and all the tissues adjacent, were softened to a degree of almost complete fluidity. The white fibres floated up like delicate fringes. They appeared as if ravelled out into fibrillæ. So great was the softening, that no complete examination of these parts could be made. Their condition was in marked contrast to the state of the remaining white structures of the brain, as, for instance, the corpus callosum. I emphasize this, because so much time had elapsed since death, as to give rise to the suspicion that the softening might be post-mortem.

Furthermore, as explanation of the softening, and the key to all the lesions, both internal carotid arteries were perfectly atheromatous. Their walls were stiff; they stood up with open mouths, and looked like goose-quills. The basilar artery and posterior cerebral arteries were collapsed and apparently healthy.

Microscopic examination could add little to the information obtainable by the naked eye, because the interesting parts had undergone so great degeneration.

The right optic nerve was removed as far as to the eyeball and microscopically examined by my friend, Dr. F. Delafield. He reported the nerve fibres disintegrated to a granular condition, and so completely disorganized as to leave no trace of their normal structure. There was no increase of connective tissue.

Taken together, the lesions gave full justification to the diagnosis which the ophthalmoscope furnished—that there was serious and fatal disease of the brain. But no opinion could be formed as to the nature of the disease.

Acute glaucoma, from cerebral apoplexy, is cértainly uncommon. Bouchut mentions two cases, one of them well made out, the other doubtful. It seems to me most probable that the apoplexy at the base of the brain must have occurred at the beginning of the sickness, and that situated in the close vicinity of the optic chiasm and near to the cavernous sinus and carotid arteries, it was the cause of the acute glaucoma. The cerebellar apoplexy was probably of little influence. The development of atrophy in the right optic nerve might have been due to the changes following the apoplexy, or it might have been caused indirectly by the softening at the middle of the brain. The softened portions involved the neighbourhood of the tubercula quadrigemina, and they might have begun to share in the disintegration.

The general symptoms, so anomalous in character, and so puzzling to sound and observant practitioners, must undoubtedly be referred to the brain, although it may not be possible to understand precisely their connections.

Finally, I may add that the basilar process of the occipital bone was unusually soft; it could be penetrated by the point of the scalpel with undue facility. It seemed to be hyperæmic, and the suggestion occurred to me that its condition might have had something to do with the peculiar respiration, by irritation of the roots of the pneumogastric nerve.

This case belongs to a category of which, as yet, few examples have been observed, and, so far as I have been able to find, none are recorded. It gives us additional data to aid us in the diagnosis of difficult and obscure cases of brain trouble. This subject demands immediate and thorough study, and we may yet be able to see with the ophthalmoscope, not only that there is brain disease, but pronounce, with strong probability, upon the character and exact location of the malady.

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ART. VII.—*Malignant Pustule, as it appeared in the Vicinity of Las Cruces, New Mexico, in* 1865. By A. H. SMITH, M.D., Assistant Surgeon U. S. A.

DURING the summer of 1865, there appeared, in the vicinity of Las Cruces, New Mexico, an epidemic resembling the charbon, or malignant pustule of surgical writers.